

C<sup>1</sup>

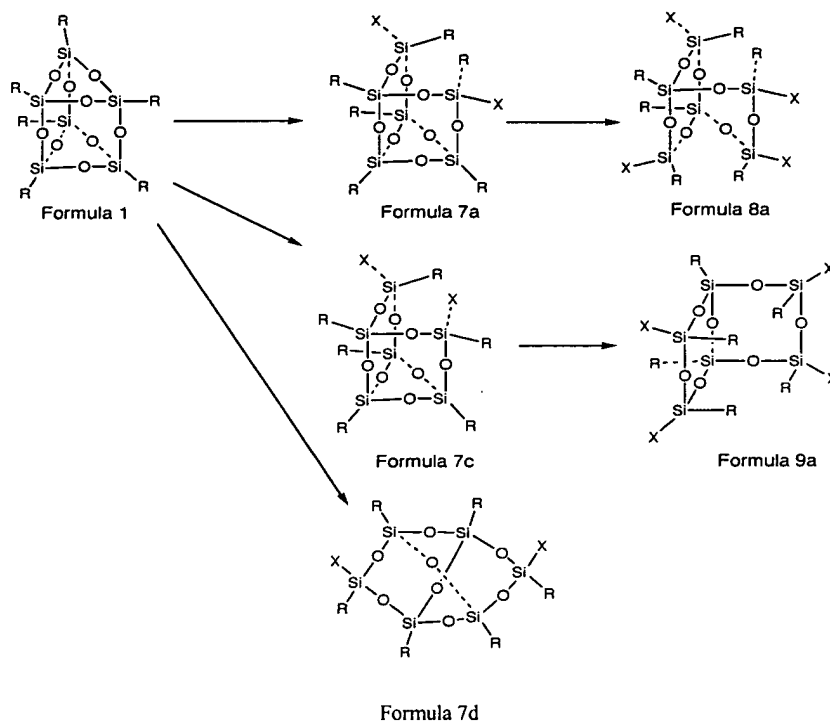
5. A method for selectively opening the rings in POSS compounds to form functionalized POSS derivatives comprising, reacting  $[(\text{RSiO}_{1.5})_n]_{\Sigma\#}$ ,  $[(\text{RSiO}_{1.5})_n(\text{R}^3\text{SiO}_{1.5})_m]_{\Sigma\#}$  or  $[(\text{RSiO}_{1.5})_n(\text{R}^1\text{R}^2\text{SiO}_{1.0})_m]_{\Sigma\#}$  with a strong acid to form said derivatives, having a conjugate base X, which base is F, OH, SH, NHR, NR<sub>2</sub>, ClO<sub>4</sub>, SO<sub>3</sub>CH<sub>3</sub>, SO<sub>3</sub>CF<sub>3</sub>, SO<sub>3</sub>OH, SO<sub>3</sub>Cl, SO<sub>3</sub>CH<sub>3</sub>, NO<sub>3</sub>, PO<sub>4</sub> or Cl, where n is 6-12, m is 1-10, where R<sup>1</sup>, R<sup>2</sup> and R<sup>3</sup> are different substituents than R which are all selected from the group consisting of aliphatic, aromatic, olefinic, alkoxy, siloxy and H and where # is the sum of the lettered substituents in said POSS compound.

10. The method of claim 5 wherein  $[(\text{RSiO}_{1.5})_n(\text{R}^3\text{SiO}_{1.5})_m]_{\Sigma\#}$  is reacted with said acid to form  $[(\text{RSiO}_{1.5})_6(\text{R}^3\text{XSiO}_{1.0})_1(\text{RXSiO}_{1.0})_1]_{\Sigma 8}$ , where R<sup>3</sup> is of the same group as R but is a different substituent and # is m + n.

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11. The method of claim 5 wherein  $[(\text{RSiO}_{1.5})_7(\text{R}^3\text{SiO}_{1.5})_1]_{\Sigma 8}$  is reacted with said acid to form  $[(\text{RSiO}_{1.5})_4(\text{RXSiO}_{1.0})_3]_{\Sigma 7}$  and a by-product containing R<sup>3</sup> wherein R<sup>3</sup> is of the same group as R but is a different substituent.

12. The method of claim 3 wherein the compound of formula 1 is reacted with said acid to form a compound selected from the formulas 7a, 8a, 7c, 9a or 7d as follows:



18. A polyhedral oligomeric silsesquioxane (POSS) compound of the formula,

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$[(\text{RSiO}_{1.5})_n (\text{RXSiO}_{1.0})_m]_{\Sigma\#}$ , where n is 4-24, m is 1-10, R is aliphatic, aromatic, olefinic, alkoxy, siloxy or H and X is the conjugate base of an acid, which base is of F, OH, when the OH groups are in an exo-stereochemical position, SH, NHR or  $\text{NR}_2$ ,  $\text{ClO}_4$ ,  $\text{SO}_3\text{OH}$ ,  $\text{SO}_3\text{CF}_3$ ,  $\text{SO}_3\text{Cl}$ ,  $\text{SO}_3\text{CH}_3$ ,  $\text{NO}_3$ , or  $\text{PO}_4$ .

20. A method for expanding rings in polyhedral oligomeric silsesquioxane (POSS) compounds

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comprising, reacting  $[(\text{RSiO}_{1.5})_n (\text{R}(\text{HO})\text{SiO}_{1.0})_m]_{\Sigma\#}$  with  $\text{Y}_2\text{SiR}^1\text{R}^2$  silane reagents to obtain at least one expanded POSS ring in  $[(\text{RSiO}_{1.5})_{n+m} (\text{R}^1\text{R}^2\text{SiO}_{1.0})_j]_{\Sigma\#}$ , where R,  $\text{R}^1$  and  $\text{R}^2$  are aliphatic, aromatic, olefinic, alkoxy, siloxy or H, Y is halide or amine, n is 4 – 24, m is 1 - 10 and j is 1-10 and # is the sum of the lettered substituents in said respective POSS compounds.

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26. The composition of claim 25 selected from the group consisting of one of:

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